

D: Operations, Maintenance & Management



Chapter Outline:

Overview

Greenway Facility Safety and Security

Routine and Remedial Operations

Routine and Remedial Maintenance

Administration and Responsibilities

Cost of the Operations & Maintenance Program

Funding the Operations & Maintenance Program

Operations and Maintenance Resources for Conflict Resolution

OVERVIEW

Operations and maintenance refers to specific day-to-day tasks and programs performed to assure resources and facilities are kept in good, safe, usable condition. This begins with sound design, durable components, and a comprehensive management plan. A management plan should be embraced by the entities responsible for maintaining the greenway and trail network, at the beginning of the implementation process. In addition, community groups, residents, business owners, developers and other stakeholders should be engaged in the long term stewardship of the resources preserved and enhanced by this plan as discussed later in this chapter.

GUIDING PRINCIPLES FOR EFFECTIVE OPERATIONS AND MAINTENANCE

The Wake Forest greenway and trail system should be viewed and maintained as a public resource. Indeed it will become infrastructure similar to the street system or utility networks, serving the community for generations to come. The following guiding principles will help assure the preservation of a first class system:

- Good maintenance begins with sound planning and design
- Foremost, protect life, property and the environment
- Promote and maintain a quality outdoor recreation and transportation experience
- Develop a management plan that is reviewed and updated annually with tasks, operational policies, standards, and routine and remedial maintenance goals
- Maintain quality control and conduct regular inspections
- Include field crews, police and fire/rescue personnel in both the design review and on-going management process
- Maintain an effective, responsive public feedback system and promote public participation

- Be a good neighbor to adjacent properties
- Operate a cost-effective program with sustainable funding sources

RESOURCE STEWARDSHIP AND ENHANCEMENT

A well-managed greenway and trail system is critical to the long-term success of this Plan. This involves stewardship, the oversight of resources, and operations and maintenance. Stewardship might range from cleaning up litter to assuring that a project does not visually scar the surrounding landscape.

The stewardship process must consider both private sector- such as land subdivision and development- and public sector activities- such as the construction of roads and utilities. In pursuit of this, coordination among agencies at the local, regional, state, and federal level is vital to assure that these activities are supportive of the plan and complementary to each other. Long term stewardship also calls for the enduring commitment of agency staff, elected officials and concerned citizens all working together. This suggests the need for a shared community vision and value system centered on the protection of greenway, trail, bicycle, pedestrian, and outdoor recreational resources. This plan and similar plans can help coordinate and guide that action.

GREENWAY FACILITY SAFETY AND SECURITY

Safety is a duty and obligation of all public facility managers. Therefore, as the construction documents for the Wake Forest greenway are completed, appropriate local, state, and federal agencies should review these plans and specifications to ensure that they meet all existing regulations.

In order to provide reasonable and ordinary safety measures, Wake Forest should develop and implement a Safety and Security Program. This program should consist of well-defined safety and security policies; the identification of trail management, law enforcement, emergency and fire protection policies; and a system that offers timely response to the public for issues or problems related to safety and security. The Town will need to implement internal coordination for safety and security between Parks and Recreation, Police, Fire, Public Works, and Administration Departments. Additionally, procedures and policies should be established for external coordination among the Town, local alliances, local neighborhood watch associations, and “Adopt-a-Greenway” organizations. Important components of the Safety and Security Program should include:

1. Establishment of a safety committee or coordinator
2. Preparation of a trail safety manual for employees and agencies
3. Establishment of user rules and regulations
4. Development of greenway and trails emergency procedures
5. Preparation of a safety checklist for the trail
6. Preparation of a trail user response form
7. A system for accident reporting and analysis
8. Regular maintenance and inspection program
9. Site and facility development and review
10. Public information program
11. Employee training program for safety and emergency response
12. Ongoing research and evaluation of program objectives

RISK MANAGEMENT AND LIABILITY

The design, development, management, and operation of the Wake Forest greenway must be carefully and accurately executed in order to provide a resource that protects the health, welfare, and safety of the public.

Liability most often occurs when a facility has been under-designed for the intended volume of use, when management of the facility is poor, or when unexpected accidents occur because the trail manager failed to recognize the possibilities of a potentially hazardous situation. To reduce the exposure to liability, the Town should have in place the following measures prior to opening the first phase of the trail:

1. A complete maintenance program that provides the appropriate duty or level of care to trail users;
2. A risk management plan that appropriately covers all aspects of the trail
3. A comprehensive working knowledge of public use laws and recent case history applicable in North Carolina

Public use of the Wake Forest greenway should be covered under existing municipal policies for the use of parkland and public spaces. The Wake Forest greenway is available for public use as defined by the Hours of Operation Policy (described below); therefore, any individual found using the trail outside the normal hours of operation would be treated as a trespasser and would not be covered by the municipal insurance policies for public use.

The Town should exercise reasonable care in the construction of all trail facilities to reduce hazardous, public nuisance and life threatening situations. Once the trail is open for use, liability can be further reduced by adopting the following practices:

- Posting and enforcement of trail regulations.
- Regular inspection of the trail by a person qualified to identify hazardous conditions and maintenance problems.
- Timely correction and documentation (e.g., notes, photographs) of maintenance problems. When a problem cannot be promptly corrected, warnings to trail users should be erected.
- Maintenance of inspection records including findings and responses.
- Development of procedures for handling medical emergencies and documentation of their occurrence.

These risk management techniques will not only help to ensure that hazardous conditions are identified and corrected in a timely manner, thereby averting injury to trail users, but will also serve to protect the Town from liability. Showing that the Town had been acting in a responsible manner can serve as an excellent defense in the event that a lawsuit develops (BCEMC 1997, p. 58).

For more information on trail-related liability laws, risk management techniques, and special risk situations, refer to the Rails-to-Trails Conservancy report “Rails-with-Trails: Design, Management, and Operating Characteristics of 61 Trails Along Active Rail Lines” (2000).

HOURS OF OPERATION

The consultant recommends that the Wake Forest greenway be operated like all other non-lighted public parks and recreation facilities open for public use from dawn to dusk, 365 days a year, except as specifically designated by the local Parks and Recreation Department. Individuals who are found using these facilities after dusk and before dawn should be deemed in violation of this policy and subject to fines and/or prosecution. Additionally, trail segments should not be considered officially opened for public use until a formal dedication ceremony and authorized agents of the Town have completed an official opening. Individuals who use greenway segments that are under construction, without written permission from an authorized agent, should also be deemed in violation of the Wake Forest greenway Hours of Operation policy.

TRAIL USER RULES AND REGULATIONS

One of the emerging safety issues in greenway trail planning, design, and development is multi-user conflict. Typically, these conflicts are caused by overuse of a trail. However, other factors may lead to user conflicts and problems including poorly designed and engineered trail alignments, inappropriate user behavior, or inadequate facility capacity. The

most effective trail use management plan is a well-conceived safety program that provides the individual user with a Code of Conduct for the trail, sometimes called a Trail Ordinance. Several multi-use trail systems across the United States have adopted progressive ordinances for public use. The consultant recommends that the following Rules and Regulations be implemented for the Wake Forest greenway. These rules should be displayed in both brochures and on information signs throughout the trail. The consultant recommends that these rules and regulations be reviewed by the appropriate authorities and legally adopted by the Town.

1. **Be Courteous:** All trail users, including bicyclists, joggers, walkers, wheelchairs, skateboarders and skaters, should be respectful of other users regardless of their mode of travel, speed, or level of skill. Never spook animals like horses and dogs - talk to them in a calm voice as you approach. Respect the privacy of adjacent landowners.
2. **Keep Right:** Always stay to the right as you use the trail, or stay in the lane that has been designated for your user group. The exception to this rule occurs when you need to pass another user.
3. **Pass on the Left:** Pass others going in your direction on their left. Look ahead and behind to make sure that your lane is clear before you pull out and around the other user. Pass with ample separation. Do not move back to the right until you have safely gained distance and speed on the other user. Faster traffic should always yield to slower and oncoming traffic.
4. **Give Audible Signal When Passing:** All users should give a clear warning signal before passing. This signal may be produced by voice, bell, or soft horn. Voice signals might include "Passing on the Left!" or "Cyclist on the left!" Always be courteous when providing the audible signal- profanity is unacceptable.
5. **Be Predictable:** Travel in a consistent and predictable manner. Always look behind before changing position on the trail, regardless of your mode of travel.
6. **Control Your Bicycle:** Inattention, even for a second can cause disaster- always stay alert! Maintain a safe and legal speed at all times.
7. **Don't Block the Trail:** When in a group, including your pets, use no more than half the trailway, so as not to block the flow of other users. If users approach your group from both directions, form a single line, or stop and move to the far right edge of the trail to allow safe passage by these users.
8. **Yield when entering or Crossing Trails:** When entering or crossing a trail at uncontrolled intersections, yield to traffic already using the other trail.

9. **The Use of Lights:** When using a trail during periods of low visibility each cyclist should be equipped with proper lights. Cyclists should have a white light that is visible from five hundred feet to the front, and a red or amber light that is visible from five hundred feet to the rear. Other trail users should use white lights (bright flashlights) visible two hundred fifty feet to the front, and wear light or reflective clothing.

10. **Don't Use this Trail Under the Influence of Alcohol or Drugs:** It is illegal to use this trail if you have consumed alcohol in excess of the statutory limits, or if you have consumed illegal drugs. Persons who use a prescribed medication should check with their doctor or pharmacist to ensure that it will not impair their ability to safely operate a bicycle or other wheeled vehicle.

11. **Clean up Your Litter:** Please keep this trail clean and neat for other users to enjoy. Do not leave glass, paper, cans, or other debris on or near the trail. Please clean up after your pets. Pack out what you bring in- and remember to always recycle your trash.

12. **Keep Pets on Leashes:** All pets must be kept on a secure and tethered leash. Failure to do so will result in fines and possible detention of the pet.

13. **Use the Buddy System:** Use the trail system with a friend!

14. **Trail Subject to Flash Flooding:** Please be aware that the Wake Forest greenway is officially closed during times when floodwaters overflow the creek banks and cover the trail surface. For your personal safety, please be prepared to leave the trail immediately during periods of heavy rainfall.

15. **Swimming Prohibited:** Swimming is prohibited in creeks and tributary streams.

16. **Vegetation Removal:** It is illegal to remove vegetation of any type, size, or species from the trail. Please contact the Parks and Recreation Department or Planning and Inspections Department should you have concerns about noxious weeds, poisonous vegetation, dying or dead vegetation, or other concerns about vegetation growth in the greenway.

17. **Share the Trail:** Always exercise due care and caution when using the trail!

POLICE/PARK RANGER PATROL AND EMERGENCY RESPONSE SYSTEM

In order to provide effective patrol and emergency response to the needs of trail users and adjacent property owners, the consultant recommends that the Town Police and Parks and Recreation Departments work together, to develop a specific patrol and emergency response plan for the Wake Forest greenway. This plan should define a cooperative law enforce-

ment strategy for the trail based on the capabilities of different agencies and services typically required for the facility. There will be numerous phases of the trail until completion, each consultant as they are hired for each phase should be required to work with the designated departments to deliver a site plan that illustrates points of access to the trail; approved design details for making these access points safe, secure, and accessible to law enforcement officials; and potential locations for a system of cellular-type emergency phones. The consultant will also work with appropriate officials to locate other mechanisms or project elements that will aid local agencies in managing the trail in a safe and secure manner.

The Police and Parks and Recreation Departments should also define an emergency response system in conjunction with appropriate local fire stations and paramedic units that defines which agencies should respond to 911 calls, and provides easy-to-understand routing plans and access points for emergency vehicles. Local hospitals should be notified of these routes so that they may also be familiar with the size and scope of the project. The entire trail system will be designed and developed to support a minimum gross vehicle weight of 6.5 tons to allow emergency vehicle access.

At all public entrances to the Wake Forest greenway, appropriate signage should be installed to notify trail users of the potential for flash flooding and the need to quickly exit the trail during periods of heavy rainfall.

REFERENCES AND ADDITIONAL RESOURCES

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Kozlowski, J. C. et al. "The Supply of Recreational Land and Landowner Liability: Recreational Use Statutes Revisited."

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RTC, 1996. “Acquiring Rail Corridors: A How To Manual.” Edited by Jeff Allen and Tom Iurino, Rails-to-Trails Conservancy in Cooperation with the National Park Service. Washington, D.C.

RTC, 2000. “Rails-with-Trails: Design, Management, and Operating Characteristics of 61 Trails Along Active Rail Lines.” Rails-to-Trails Conservancy. Washington, D.C., 2000.

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ROUTINE AND REMEDIAL OPERATIONS

The following task lists describe the general routine and remedial operations responsibilities for all network facilities.

ROUTINE OPERATIONS DEFINED

Routine operations refer to the daily activities required to oversee a greenway and trail system.

Task: Inter-agency design review

Coordination between and commitment of agencies responsible for greenway facilities is crucial to complete the following routine maintenance tasks. In addition to department managers, planners, designers and engineers, police and fire/rescue, and field maintenance personnel should be consulted in the design and review process. The creation of a Greenway Committee (recommended in Chapter 4: Implementation) is recommended to carry out the following tasks.

- Establish a coordinating committee with representatives from each of the participating agencies and stakeholders
- Identify an entity to provide on-going oversight, coordination, and leadership for the overall network
- Review critical public and private sector projects that might impact

the greenway, bicycle, and pedestrian projects as they come on line

- Pursue grants and cooperative agreements
- Monitor operations and maintenance and other advocacy functions now and over the years to come.
- Review accident and crime reports and take the necessary up-front actions, on a case by case basis, to assure that greenway, bicycle, and pedestrian facilities do not deteriorate due to safety concerns, crime, or from fear of criminal activity

Task: Accurate and Organized Record Keeping

Good record-keeping techniques are essential to a comprehensive operations and maintenance program. This information can be used to eliminate overlap or gaps in maintenance services provided, identify levels of use, and prioritize management needs.

- Daily activities
- Schedule of routine (and remedial) maintenance tasks
- Hazards, incidents, safety issues observed and action taken
- Inspection reports
- Annual maintenance budget, pursuing various funding sources
- Projected costs for subsequent years (short-, medium-, and long-term) to reflect on project prioritization as shown in Chapter 4: Implementation
- Internal working database for existing, planned, or proposed projects for greenway and trail system

REMEDIAL OPERATIONS DEFINED

Remedial operations refer to activities required to sustain the quality of the greenway and trail network.

Task: Program Development

- Update informational signage (rules and regulations) to communicate proper usage of all network facility types
- Update directional signage to integrate greenway, bicycle, and pedestrian systems and as new projects are implemented
- Update user maps to reflect any additions or changes to the systems or overall network and also reference the connections between greenway, bicycle, and pedestrian facilities

Task: General Operations

- Provide contact information and institute an agency response for facility users to report questions, comments, concerns, or complaints regarding the network, and a feedback phone number and Web address

Routine Maintenance Activities					
		Low Impact Trail	Multi-use Trail	On-road Bicycle and Pedestrian Facilities	Recommendations
Facility Maintenance	Sweeping	N/A	2 times/year	See Table E(b)	Paved facilities will be swept by machine or spot sweeping of bad areas will be swept by hand or with blowers. Some trails require a combination of methods. Transition areas between unpaved and paved facilities will require extra attention to remove potentially hazardous debris from the paved surfaces.
	Trash removal	2-4 times/year	6 times/year	Sidepaths 6 times/year or See Table E(b)	This includes removing ground debris. Emptying trash containers is discussed in Table E(b). Volunteers should be utilized for this task, such as Adopt-a-trail programs.
Vegetation Management	Tree and shrub trimming and pruning	Spring and fall and as needed, such as after a storm to maintain 8' high and 6-8' wide clearance	Spring and fall and as needed such as after a storm to maintain 10' high (12' high for equestrian) and 12-14' wide clearance	Spring and fall and as needed such as after a storm to maintain 10' high and 12-14' wide clearance (depending on the facility type)	Tree and shrub trimming and pruning should be performed to the Town's specifications and should be scheduled according to species type. This service will be performed for the safety of trail users, to maintain safe use of all facilities without physical obstacles, such as low-hanging tree limbs, and visual obstructions, such as limited line of sight.
	Mowing of vegetation	N/A	30 times/year	30 times/year	Vegetation along trail corridors should be mowed on a regularly scheduled basis.
	Mulching and edging	Once a year or as needed	N/A	N/A	Low impact trails may require mulch in some areas to maintain a usable trail surface. Edging to prevent encroachment of grass vegetation on trail is also needed.
	Invasive species control	Once a year and as needed in problem areas	Once a year and as needed in problem areas	As scheduled for routine maintenance of adjacent roadway	Vegetation, weed, and pest management plans should be put into place to control invasive species, protect endangered plant and animal species, and preserve wetlands, riparian buffers, and other resources of special natural, cultural, or urban infrastructure value.

Above: Maintenance of Trail Facilities

Remedial Maintenance Activities					
		Low Impact Trail	Multi-use Trail	On-road Bicycle and Pedestrian Facilities	Recommendations
Facility Repair or Replacement	Replenish gravel, mulch, or other surface materials	Once a year and as needed	N/A	N/A	
	Repaint/ restripe/ stain	N/A	N/A	N/A	
	Replace asphalt or concrete	N/A	10-12 years	10-12 years	
	Remove encroaching debris along paved trail/sidewalk edges	As needed	As needed	Edging as needed	
	Regrade to prevent or eliminate low spots and drainage issues	Only if absolutely necessary	As needed	Responsibility of Town department as part of remedial maintenance of the adjacent roadway	
	Addition or repair of culverts, bridges, boardwalks, retaining walls, etc., to prevent or eliminate drainage/ erosion issues	N/A	30 years or as needed	30 years or as needed	
	Reroute trail, if necessary, to avoid environmentally sensitive or over-used areas, safety issues, or construction projects	As needed	As needed	Responsibility of Town department with input from Committee to reroute bicycle and pedestrian facilities if the adjacent roadway is rerouted or closed	

Above: Maintenance of Trail Facilities, continued

Remedial Maintenance Activities, continued					
		Low Impact Trail	Multi-use Trail	On-road Bicycle and Pedestrian Facilities	Recommendations
Seasonal Maintenance	Remove leaf litter	N/A	As needed	As needed by Town department for sidepaths. See Table E(b).	Prioritize removal by the most heavily used facilities and geographic location. Limited development trails should be emphasized as natural environments and warnings should be posted that hazardous conditions may exist with the changing seasons.
	Remove snow and ice	N/A	As needed	As needed by Town department for sidepaths. See Table E(b).	Prioritize removal by the most heavily used facilities and geographic location. Limited development trails should be emphasized as natural environments and warnings should be posted that hazardous conditions may exist with the changing seasons.
Habitat Enhancement and Control	Plant vegetation, such as trees and shrubs	As needed to prevent erosion and introduce native plant materials into the landscape	As needed to prevent erosion or introduce landscape features during installation of a trail	Responsibility of Town department	
	Take preventative measures to protect the landscape from wildlife	As needed	As needed	As needed	
	Apply herbicide to eliminate any problem areas	As needed to discourage the growth of invasive or problem species, such as kudzu and poison ivy	As needed to discourage the growth of invasive or problem species, such as kudzu and poison ivy	As needed to discourage the growth of invasive or problem species, such as kudzu and poison ivy	
	Apply herbicide to maintain edges and prevent encroaching vegetation, such as along trails and sidewalks	N/A	As needed	As needed	

Above: Maintenance of Trail Facilities, continued

- Continue to provide and establish new public education and citizen participation programs for network users
- Pursue development of an easy to use management manual and training program and incorporate it into existing and new maintenance programs and procedures within the participating agencies

Routine and Remedial Maintenance

The following task lists describe the general routine and remedial maintenance responsibilities for all greenway and trail facilities. To complement this text, Table E(a) illustrates maintenance recommendations.

Table E(b) below lays out maintenance tasks for facilities such as pedestrian signals, crosswalks, bicycle lanes, and roadway shoulders. These types of pedestrian and bicycle facilities are provided within the roadway right-of-way and should be maintained by either the North Carolina Department of Transportation (NCDOT) or the Town of Wake Forest Public Works Department. A Wake Forest staff member should be designated as the main contact for the maintenance of pedestrian and bicycle facilities in the roadway right-of-way. This staff member should coordinate with the appropriate departments to conduct maintenance activities in the field. Funding for an ongoing maintenance program should be included in the Town's operating budget or Capital Improvements Program.

Note that the schedule is intended to provide general guidance for routine and remedial maintenance activities. The frequency of pedestrian and bicycle facility maintenance within the roadway right-of-way will vary. Maintenance needs will depend upon many factors, including pavement surface type, the use of paint or thermoplastic for markings, and traffic volumes. The Town of Wake Forest Public Works Department and NCDOT should make immediate repairs to any on-road pedestrian and bicycle facilities that are damaged or have hazardous conditions. The Wake Forest staff member in charge of maintenance should set up a free maintenance hotline for people to provide information about spot maintenance needs in the urban area.

ROUTINE MAINTENANCE DEFINED

Routine maintenance refers to the day-to-day regimen of litter pick-up, trash and debris removal, weed and dust control, trail sweeping, sign replacement, tree and shrub trimming, and other regularly scheduled activities. Routine maintenance also includes minor repairs and replacements such as fixing cracks and potholes or repairing a broken hand railing.

Task	Frequency	Comments
Regular Inspection	2 times/year	Includes all on-road bikeways, identify needed repairs of pavement signs, markings, etc.
Shoulder and bike lane sweeping	2 times/year	All roadways with bicycle facilities
Shoulder and bike lane repairs	As needed	Repair of road surface, including potholes, cracks, or other problems on bicycle facilities
Median island and curb extension repairs	As needed	Repair of curb and gutters, removal of debris
Shoulder and bike lane resurfacing	During regular roadway repaving	Ensure that pavement width is maintained or increased during repaving projects
Debris removal from shoulders	As needed	Remove debris from roadway shoulders and bike lanes such as limbs, silt, and broken glass
Snow and ice removal	As needed	Plow snow off roadway shoulders and bike lanes, and require property owners to shovel sidewalks
Pedestrian signals	As needed	Replace burned out or broken pedestrian signal heads; adjust pedestrian signal timing to accommodate MUTCD standard pedestrian walking speed
Signs and markings	As needed	Repair or replace pedestrian and bicycle warning signs, bicycle route signs, crosswalk markings, bicycle lane markings, and any other similar facilities identified during inspections
Vegetation control	During regular roadway maintenance	Mow grass and trim limbs and shrubs 2 feet back from sidewalk edge
Litter removal	6 times/year	Could be done with volunteers

Above: Maintenance of Pedestrian and Bicycle Facilities Within Roadway Rights-of-Way of Town of Wake Forest and North Carolina DOT

The following tasks should be performed on a regular basis to keep all network facilities in good, usable condition. Maintenance tasks should be conducted more frequently for greenway, bike, and pedestrian facilities where use is the most concentrated. Methods such as pedestrian and bicycle counts, sketch plan analysis methods for estimating pedestrian and bicycle demand, public survey results, and public meeting comments can be used to determine which resources are the most heavily used and may require the most maintenance attention. The frequency of required maintenance tasks should be established as new facilities are implemented and should be reviewed and updated annually to reflect any changes in usage, safety issues, etc.

Task: Facility Maintenance

Basic housekeeping of greenway and trail facilities will ensure that the network is clean and functional and will also improve the life of each facility. Volunteer efforts should be utilized in the performance of this maintenance task.

- Sweeping
- Trash removal

Task: Vegetation Management

To maintain a high quality network, regular attention should be given to the surrounding landscape, both natural and man-made. This not only improves the aesthetic quality of the network but also improves the users' sense of safety, as well.

- Tree and shrub trimming and pruning
- Mowing of vegetation
- Mulching and edging
- Invasive species control

REMEDIAL MAINTENANCE DEFINED

Remedial Maintenance refers to correcting significant defects in the network, as well as repairing, replacing or restoring major components that have been destroyed, damaged, or significantly deteriorated from normal usage and old age. Some items ("minor repairs") may occur on a five to ten year cycle such as repainting, seal coating asphalt pavement or replacing signage. Major reconstruction items will occur over a longer period or after an event such as a flood. Examples of major reconstruction remedial maintenance include stabilization of a severely eroded hillside, repaving a trail surface or a street used for biking, or replacing a footbridge. Remedial maintenance should be part of a long-term capital improvement plan.

The following tasks should be performed on an as needed basis to keep network facilities in good, usable condition. Table E(c) depicts the average life of each facility type, as well as general ancillary facilities, with normal wear and tear. The repair or replacement of existing facilities should be reflected in a projected budget for future maintenance costs.

Task: Facility Repair or Replacement

All facilities will require repair or replacement at one time or another. The time between observation and repair/replacement will depend on whether the needed repair is deemed a hazard, to what degree the needed repair will affect the safety of the user, and whether the needed repair can be performed by an in-house maintenance crew or if it is so extensive that the needed repair must be done by outside entities or replaced completely. Some repairs are minor, such as repainting or resurfacing bicycle lanes and can be done in conjunction with other capital projects, such as repaving the adjacent street.

- Replenish gravel, mulch, or other materials
- Repaint/restripe/stain
- Repave/seal
- Replace asphalt or concrete
- Remove encroaching debris along paved trail/sidewalk edges
- Regrade to prevent or eliminate low spots and drainage issues

Facility	Lifespan
Mulch	2-3 years
Granular stone	7-10 years
Asphalt	7-15 years
Concrete	20+ years
Boardwalk	7-10 years
Bridge/underpass/tunnel	100+ years

Above: Longevity of Facilities

- Add culverts, bridges, boardwalks, retaining walls, etc., to prevent or eliminate drainage/erosion issues
- Reroute trail, if necessary, to avoid environmentally sensitive or overused areas and any safety issues

Task: Seasonal Maintenance

Seasonal tasks should be performed as needed. When conditions cannot be improved to provide for safe use, the facility should be closed to prevent the risk of injury to facility users. Designated maintenance crews will remove leaf debris, snow, and ice, etc. from all network facilities as soon as possible. Leaf debris is potentially hazardous when wet and special attention should be given to facilities with heavier usage. Ice control and removal of ice build-up is a continual factor because of the freeze-thaw cycle. Ice control is most important on grade changes and curves. Ice can be removed or gravel/ice melt applied. After the ice is gone, left-over gravel should be swept as soon as possible.

- Remove leaf litter from network facilities, via raking, blowing, mulching, etc. as needed to sustain the safe usability of all network facilities and prevent any storm water drainage and/or erosion issues
- Remove snow and ice from network facilities, via shoveling, picking, salt, sand, etc. as soon as possible after storm

Task: Habitat Enhancement and Control

Habitat enhancement and control can improve aesthetics, help prevent erosion, and provide for wildlife habitat. Habitat control involves mitigation of damage caused by wildlife.

- Plant vegetation, such as trees and shrubs
- Take preventative measures to protect landscape features from wildlife, such as installing fencing around sensitive or newly planted plant materials
- Apply herbicide to eliminate any problem plant species, such as poison ivy or kudzu, etc.
- Apply herbicide to maintain facility edges and prevent encroaching vegetation, such as along trails and sidewalks
- Deter interaction between facility users and facility inhabitants, such as feeding the wildlife, etc.

ADMINISTRATION RESPONSIBILITIES

OPERATION RESPONSIBILITIES BY DEPARTMENT

For a successful Open Space and Greenway System to be developed it is critical for the players to understand their role in supporting and managing the system.

Role of Wake Forest

The Wake Forest Open Space and Greenway System will be developed and managed by the Town and its departments. Listed below and on the following pages are the key departments and organizations that will play a role in this implementation.

Role of Parks and Recreation Department

As the primary developer of greenways, the Parks and Recreation Department is the most prominent participant in the Open Space and Greenway Plan. The Department will be responsible for the design, management and maintenance of the greenway system. The Parks and Recreation Department will need to work closely with the Planning Department in the siting of greenways.

Role of the Planning Department

The Planning Department should provide support for the Open Space and Greenway Plan and assistance with future implementation of the system. This can be accomplished by defining future greenways within related planning efforts; utilizing the rezoning process to encourage dedication of lands, including sidewalks and bicycle facilities for the Open Space and Greenway System; and planning transportation improvements in coordination with greenways.

Role of Public Utilities Department and Water Resources Department

The Public Utilities Department and Water Resources Department are important players in the implementation strategy for the Open Space and Greenway System. The Departments manage the systems of sanitary and stormwater sewers which offers enormous potential for shared use with greenway development objectives. For the expansion and development of new sanitary sewer lines, the Water Resources Department should consider the use of a joint-use easement document during right-of-way negotiations to acquire subsurface and surface rights from willing sellers. Additionally, Public Utilities stormwater management objectives can be enhanced through the development of the Open Space and Greenway System through the use of funds obtained from federal and state grants. The Departments could function as greenway developers in partnership with the Parks and Recreation Department.

Role of Department of Police Services

The Department of Police Services should assist the Parks and Recreation Department with patrolling and law enforcement for Open Space and Greenway System lands and facilities.

ROLE OF PRIVATE SECTOR

The private sector throughout Wake Forest is the primary beneficiary of the Wake Forest Open Space and Greenway System. As such, private organizations, businesses and individuals can and should play an important role in the development and management of the system. Private sector groups and businesses can sponsor implementation projects for open space and greenways as a partner of the Town. These groups can also help to maintain open space and greenway lands through cooperative management agreements with the Town.

Role of Local Businesses and Corporations

Wake Forest businesses and corporations might choose to sponsor a segment of greenway for development or maintenance. Businesses and corporations can work with the Parks and Recreation Department to give money, materials, products and labor toward the development of a greenway facility. Businesses can also consider installing facilities, such as bike racks or lockers, benches, and signage that links their operations to the Open Space and Greenway System.

Role of Civic Organizations

Local civic groups and organizations, including the Junior League, Boy Scouts and Girl Scouts, Women's Club, Chamber of Commerce, garden clubs, YMCA, Kiwanis and Rotary Clubs, to name a few, can be participants in the Wake Forest Open Space and Greenway System. These organizations can play a vital role in building sections of greenway trails, maintaining and managing greenway lands and facilities, and co-hosting events that raise money for the Open Space and Greenway System.

There are many ways in which civic organizations can participate in the development of the Open Space and Greenway System. The most appropriate involvement can be determined by matching the goals and objectives of each organization to the needs of the greenway program.

ROLE OF INDIVIDUAL CITIZENS

Local residents who are interested in the development of Wake Forest's Open Space Greenway System can participate by agreeing to donate their time, labor, and expertise to the Parks and Recreation Department.

Residents might choose to partner with a friend or form a local neighborhood group that adopts a section of greenway for maintenance and management purposes. As an adopt-a-greenway organization, individuals might help pick-up trash, plant flowers and trees, care for newly planted vegetation and serve as additional “eyes and ears” for safety and security on open space and greenway lands. All volunteer efforts would be recognized by the Parks and Recreation Department through a community-wide program.

MAINTENANCE RESPONSIBILITIES BY FACILITY TYPE

Maintenance responsibility will continue to be with the Parks and Recreation and Public Works Departments depending on the type of facility to be maintained and whether or not it is routine or remedial. A number of other jurisdictions and entities, homeowner associations, and business groups will also have roles in maintaining specific facilities in the pedestrian, bicycle, and greenway networks. It will be helpful to create a citizens’ group that could ultimately play an important role in coordinating and advocacy (See stewardship discussion, Section E.1.2). A recommended maintenance schedule is included in Tables E(a) and E(b) for each system.

Low Impact Trail

These spaces would be maintained by Town Parks and Recreation crews or by homeowner associations where appropriate, for dedicated areas added into the system by new development.

Multi-use Trail

The Town Parks and Recreation and Public Works Departments will continue to be the key agencies in the maintenance of facilities along roads, utility corridors, and stream corridors. The Parks and Recreation Department, or where appropriate, homeowners associations, should conduct routine maintenance of greenways. Public Works should be responsible for remedial maintenance of hardscape components.

On-road Bicycle Facilities

A key to continued success will be the establishment and acceptance of bicycle facility operations and maintenance guidelines and proper training of both supervisory and field personnel regarding on-road bicycle facility upkeep. There should also be interagency coordination and user feedback protocols that assure timely response to citizen complaints and suggestions, including a website and toll-free hotline for pedestrian and bicycle maintenance requests. Bicycle route signs and bicycle racks should also be maintained by NCDOT, depending on the types and locations of facilities. Refer to the Wake Forest Bicycle Transportation Plan for more information on on-road bicycle facilities.

Pedestrian Facilities (On-road sidewalk/sidepath)

Within the Town of Wake Forest, major sidewalk repairs are made by the Public Works Department. Routine sidewalk maintenance should also be performed by the adjacent property owners and tenants, as prescribed by town ordinances. This may include individual owners, business and resident associations and special districts, as applicable. In suburban and rural areas outside the Town, sidewalks on main roadways should be maintained by NCDOT and sidewalks on residential streets should be maintained by property owners.

Trailheads and Feature Areas

These areas are to be maintained by the Public Works and Parks and Recreation Department or the respective homeowners associations if appropriate.

Other Ancillary Facilities

Special furnishings and amenities such as benches and signage will be the responsibility of the appropriate jurisdictional entity such as the Public Works and Parks and Recreation Departments.

ADMINISTRATIVE AND JURISDICTIONAL RECOMMENDATIONS

Actions to implement the following administrative and jurisdictional recommendations are described below. Collaboration between off-road greenways and on-road bicycle and pedestrian facility development should occur between the Greenway Committee (discussed in Chapter 4: Implementation) and the Town Parks and Recreation Department.

Greenway

Currently, the Park and Recreation Department is responsible for 561 acres of parkland, including greenway planning, operations, and maintenance. However, funding can be increased to assist in these efforts. In order to increase the revenue generated for operations and maintenance of greenway facilities, the following actions are recommended.

Action: Develop a non-profit group or coalition for greenways.

The following is an example list of the duties associated with the Friends of the Little Tennessee River Greenway in Macon County, NC. Friends of the Greenway (FROGs) assist Macon County in the management and development of the Little Tennessee River Greenway in a number of ways:

- Serve the public through the acquisition, restoration, protection, and enhancement of the natural resources.
- Integrate public recreational, historical, and cultural facilities with compatible commercial interest adjoining the Greenway.
- Develop an informational center and educational materials to enhance awareness of environmental and historical value of the Greenway.
- Assist local government in funding through grants, donations, leasing of concessions, and special events.
- Maintain a board and committees that fairly represent a diversity of interests in the community

The Town of Wake Forest should work to establish a “Friends of the Greenway” organization that can help to advocate for and promote the full development of the community-wide greenway system. Friends groups can help to raise awareness and funds for greenway facility development and operation. The mission of these groups can be very simple, for example, the Friends of the Grand Forks Greenway has the following mission:

“The Friends of the Greenway is a volunteer community grass-roots effort to support the development of the Red River and Red Lake River corridors that exist between the Army Corps of Engineers Flood Protection Project within the cities of Grand Forks, ND and East Grand Forks, MN.”

Typically, Friends of the Greenway will assist the Town with promoting and advocating for the greenway system. They can sponsor events that raise funds for the system. They can host community forums and meetings that increase awareness. They can sponsor events, such as hikes and races, which encourage residents of the community to use the greenways more often. Many Friends organizations operate under a non-profit, 501c3 status so that they can receive contributions from individuals and private sector groups.

Action: Hire and train new greenway maintenance crew personnel

- To maintain greenway facilities as described in Table E(b), Greenway Routine and Remedial Maintenance Tasks

The Parks and Recreation and Public Works Departments currently maintain recreational and trail facilities. Maintenance responsibilities include mowing, weed eating, repair of storm damage, blowing trails, removing leaves, rail painting, installing drainage, pesticide application (with license), etc. To improve maintenance standards for greenway

facilities and predict future maintenance needs, the consultant recommends one maintenance crew person for every 15 miles of trail in need of maintenance. As additional mileage is added to the system, staff should be added in part-time or full-time positions to accommodate greater maintenance needs.

COST OF THE OPERATIONS & MAINTENANCE PROGRAM

Annual operations and maintenance costs vary, depending upon the facility to be maintained, level of use, location, and standard of maintenance. Operations and maintenance budgets should take into account routine and remedial maintenance over the life cycle of the improvements and on-going administrative costs for the operations and maintenance program. Table E(d) provides an overview of approximate costs for basic bicycle, pedestrian and greenway trail operations and maintenance services. The estimates include field labor, materials, equipment and administrative costs.

ROUTINE OPERATIONS AND MAINTENANCE COSTS

While actual costs will vary depending upon a number of factors, such as future availability of water and labor rates, the following estimates can provide a general idea of potential operations and maintenance obligations. Refer to the Wake Forest Bicycle Transportation Plan for more information on activities and costs.

Low Impact Trails

Annual maintenance costs range from nominal to \$2,000 per mile/year depending on usage and level of development. Volunteers may absorb all or part of this function.

Multi-use Trails

Crew sizes tend to range from 0.5 to 5 full-time employees (FTEs) per 10 miles of off-street trail. This plan recommends at least one FTE per 15 miles of trail. Annual routine maintenance costs may range from less than \$3,000 to over \$7,000 per mile. Routine cleanup and monitoring of facility conditions should be handled by volunteers and maintenance crews.

On-road Bicycle Facilities

It is assumed that the Town of Wake Forest Public Works Department and NCDOT Maintenance Division will be able to maintain the on-roadway bicycle facility system. Some provision should be made, however, for 15 regular inspections per year, to include minor repair or replacement of signs, vegetation grooming and other items that an inspector could

Description/ Activity	Frequency	Costs
Drainage maintenance	4 times/year	\$750/mi
Sweeping/ blowing trails	20 times/year	\$1500/mi
Pick up and trash removal	20 times/year	\$1500/mi
Weed control	10 times/year	\$1250/mi
Mowing 3-foot safe zone	20 times/year	\$1800/mi
Minor repairs	Once/year	\$750/mi
Maintenance and supplies	Once/year	\$500/mi
Equipment fuel and repairs	Once/year	\$1000/mi
Total maintenance per mile per year		\$9050

remedy in the field. Additional attention should be paid to any potholes or other pavement damage. Some additional sweeping will be required where bicycle lanes and wider shoulders are provided along roads.

Pedestrian Facilities (On Road Sidewalk/Sidepath)

In the Town of Wake Forest, the Public Works Department maintains sidewalk facilities. Local property owners or Homeowner Associations (HOAs) should be responsible for routine maintenance of sidewalks with the Town responsible for more significant repairs. Crosswalks, pedestrian signals, curb ramps, median crossing islands, and other pedestrian facilities should be maintained by Public Works and NCDOT, depending on right-of-way ownership. It is recommended that NCDOT maintain all sidewalks on NCDOT rights of way. Maintaining these pedestrian facilities is an important part of maintaining the complete right of way for all users. NCDOT should maintain sidewalks and pedestrian crossing facilities on major roadways in areas outside of the Town of Wake Forest. Cracks, surface defects, tree root damage, and other problems should be identified on a regular basis and fixed to ensure that sidewalks remain accessible to all types of pedestrians.

REMEDIAL OPERATIONS AND MAINTENANCE COSTS

Low Impact Trails

For purposes of this study, remedial work on non-paved trails will be assumed to be negligible, since volunteers may accomplish much of this work. There may be some administrative costs associated with this.

Multi-use Trails

A 10- to-12-year life is assumed for asphalt and crushed fine trails after which an overlay may be required. A complete resurfacing after 20 to 25 years is anticipated. Concrete is assumed to last twice as long. Bridges, tunnels, retaining walls and other heavy infrastructure are assumed to have a 100-year life or longer.

On-road Bicycle Facilities

Remedial work for on-road bicycle facilities includes asphalt repaving (5' on either side of the street for a two-way bike route, total 10' width) along with curb and gutter, sewer-grate and manhole repair. Pothole and crack repair are considered routine. Pavement markings, such as bicycle lane lines, bicycle stencil markings, and edgelines should be re-installed when other roadway pavement markings are improved. Since this work is done as part of the current street maintenance regime the cost is assumed to be covered.

Pedestrian Facilities (On Road Sidewalk/Sidepath)

Sidewalks should be constructed with concrete, which requires replacement in 50 to 75 years. A rough cost estimate for a linear mile of concrete sidewalk could be provided by the Town's Public Works Department, including the base material, concrete, and construction work. Costs for design and Right-of-Way (ROW)/easement purchases should also be considered.

FUNDING THE OPERATIONS & MAINTENANCE PROGRAM

Identifying funding sources, creating funding sources and sustaining reliable funding over the long term is critical to the overall success of operations and maintenance and, ultimately, the success and growth of the Wake Forest greenway and trail network. Several types of funding sources can be identified and a combination of these might offer the best solutions. The following are potential sources for operations and maintenance. Appendix C identifies funding sources for project design and implementation.

Budget Allocations to Current Agency Programs

These are funds coming directly from existing agency and department programs as part of annual budget contributions. Typically this is the base revenue source for operations and management.

Multi-Objective Partnerships

Most trails serve multiple public and private benefits including access for floodway and ditch upkeep, utility access, street maintenance, and enhancement of adjacent private properties. This may pose a number of opportunities for task sharing and cost sharing among the various beneficiaries, particularly with respect to storm drainage management along river, creek, and wetland corridors.

In-Kind Services

In-kind services involve people, such as volunteers, youth and student labor, and seniors to provide routine maintenance practices to network facilities. In-kind services may also include donations of material and equipment. Another consideration is the adopt-a-trail program, which works with service clubs, scouts, school groups, businesses and others. Adopt-a-trail programs should include credit signage and written agreements with the adopting group.

Trust Fund

Working in partnership with a Friends of the Greenway group, the Town of Wake Forest may be able to establish a Greenway Trust Fund. This trust fund would be a dedicated source of funding that supports the operation and management of portions of the greenway system. The Friends of the Greenway would work with a private financial institution to set up an investment account or work with a local foundation to establish an endowment. Contributions to the fund would be solicited from greenway advocates, businesses, civic groups, and other foundations. The goal would be to establish a capital account that would earn interest and use the interest monies to support greenway maintenance and operations. Special events could be held whose sole purpose is to raise capital money for the Trust Fund. A trust fund can also be used in the acquisition of high-priority properties that may be lost if not acquired by private sector initiative.

Example: The Mountains-to-Sound Greenway Legacy Fund, Washington- The Mountains-to-Sound Greenway Legacy Fund is an endowment fund managed by The Seattle Foundation. Its purpose is the protection of the Mountains-to-Sound Greenway, for the public good, in perpetuity. It will be used to support restoration, enhancement, education and advocacy programs of the Mountains-to-Sound Greenway Trust. It is currently involved in a multi-year endowment fund campaign with a goal to raise \$5 million.

Revenue from Programming

The Town of Wake Forest should also work with a Friends of the Greenway to capture and direct fees and revenues that are derived from greenway events and activities into an account that can be dedicated to operating and managing the greenway system. Revenues could be used to support the Greenway Trust Fund. There are numerous opportunities to program greenway lands and facilities for activities that can generate revenues. The Town of Wake Forest should work actively, and in partnership with a Friends of the Greenway organization, to define events that can occur throughout the calendar year, and determine which of these events has the capability of generating revenues that support operations and management of the greenway. Grand Forks, North Dakota, has demonstrated that a properly operated greenway can generate upwards of \$250,000 in direct revenues annually for use in offsetting the cost of operations and maintenance costs.

OPERATIONS AND MAINTENANCE RESOURCES FOR CONFLICT RESOLUTION

- Plan, design, and manage to reduce conflicts among users, with adjacent properties including: reckless and unsafe behavior; incompatible uses; trespassing; disturbances and adverse environmental impacts
- Recognize the different goals of different users, such as equestrians and bicyclists, and separate where feasible
- Provide user education through signage, patrol, volunteers, brochures, and media
- Provide adequate trail mileage and bicycle, pedestrian, and greenway acreage to accommodate user populations
- Solicit input from user groups by providing contact information to report problems and responding promptly and effectively to complaints, concerns, or suggestions

- Monitor, document, and log problem areas and address problems through design and management
- Promote trail etiquette
- Educate bicyclists and hikers on how to pass horses using subdued voice cues rather than bells, horns, or sudden loud noise that might startle a horse
- Avoid excessive regulatory signage
- Employ temporary closure of facilities when conditions dictate or for resource recovery
- Maintain facilities as specified in this chapter
- Distribute or publish a maintenance schedule
- Respond to illegal or disturbing activity quickly